

Science Bowl Questions 1994

Round 2

Toss-Up

1. ERSC; Multiple Choice: Approximately how old are the oldest rocks discovered to date in North America?
 - a) 900 million years
 - b) 1 billion years
 - c) 4 billion years
 - d) 8 billion years

ANSWER: C – ABOUT 4 BILLION YEARS

Bonus

1. ERSC; Short Answer: Based on current thinking, how did apatosaur produce offspring?

ANSWER: LIVE BIRTH – THERE IS NO EVIDENCE OF NESTING SITES ANYWHERE TO SUGGEST APATOSAUR LAID EGGS.

Toss-Up

2. CHEM; Short Answer: A layer of alcohol is made to float on a layer of water. After a while the alcohol and water are completely mixed. What physical process took place?

ANSWER: DIFFUSION

Bonus

2. CHEM; Multiple Choice: Since thermometers cannot be used at temperatures approaching absolute zero, the temperature is usually defined in terms of the entropy of the system. Recently, a group at Helsinki University was able to align the spins of rhodium nuclei in an external magnetic field and drop them to a very low temperature. What fraction of a degree did they estimate the temperature to be?
 - a) millikelvin
 - b) microkelvin
 - c) picokelvin
 - d) femtokelvin

ANSWER: C – PICOKELVIN

Toss-Up

3. COMP; Short Answer: If a computer has a byte-addressable memory with a 24-bit address, how many megabytes of memory can be addressed?

ANSWER: 16

Bonus

3. COMP; Short Answer: A sequential circuit is a logic circuit that includes feedback. What is the term for a logic circuit that has no feedback

ANSWER: COMBINATIONAL

Toss-Up

4. BIOL; Short Answer: What type of virus gives rise to chicken pox?

ANSWER: HERPES (VIRUS)

Bonus

4. BIOL; Multiple Choice: Of the following, an enzyme responsible for the digestion of proteins is:

- a) maltose
- b) trypsin
- c) ptyalnin
- d) steapsin

ANSWER: B - TRYPSIN

Toss-Up

5. PHYS; Short Answer: LASER is an acronym for what?

ANSWER: LIGHT AMPLIFICATION BY STIMULATED EMISSION OF RADIATION

Bonus

5. PHYS; Short Answer: What property of laser radiation can be defined as the power radiated into a unit solid angle by unit surface of the source?

ANSWER: BRIGHTNESS (ACCEPT INTENSITY)

Toss-Up

6. GENR; Short Answer: What is the unit of energy that is equal to 10 to the 15th British thermal units?

ANSWER: QUAD

Bonus

6. GENR; Multiple Choice: Eighty quads of energy are used annually in the United States. How many quads of energy are used annually to heat swimming pools?
- a) 1
 - b) 5
 - c) 10
 - d) 15

ANSWER: B - FIVE

Toss-Up

7. CHEM; Multiple Choice: Acid mine drainage results from the oxidation and dissolution of pyrite and other sulfide minerals in mine tailings and working faces of mines. Which of the following chemical constituents is not likely to be found at elevated concentration in water affected by acid mine drainage?
- a) iron
 - b) manganese
 - c) sulfate
 - d) chloride

ANSWER: D - CHLORIDE

Bonus

7. CHEM; Multiple Choice: Which of the following compounds contains only primary hydrogens?
- a) n-hexane
 - b) 3-ethylhexane
 - c) 2,2,3,3-tetramethylbutane
 - d) 2,3-dimethylbutane

ANSWER: C – 2,2,3,3 - TETRAMETHYLBUTANE

Toss-Up

8. ASTR; Short Answer: The Moon's period of rotation around the Earth is approximately 27.3 days. What is the approximate period of rotation of the Moon about its own axis?

ANSWER: 27.3 DAYS

Bonus

8. ASTR; Short Answer: The Moon's rotation about its own axis is synchronous with its rotation around the Earth, thus it always turns the same face toward the Earth. This is a result of what phenomenon

ANSWER: TIDAL FRICTION (ACCEPT TIDES OR TIDAL TORQUES)

Toss-Up

9. BIOL; Multiple Choice: Cone cells are most closely associated with the function of:

- a) digestion
- b) absorption
- c) vision
- d) secretion

ANSWER: C - VISION

Bonus

9. BIOL; Multiple Choice: Failure of blood to clot readily when exposed to air may be due to:

- a) an oversupply of erythrocytes
- b) a deficiency of leukocytes
- c) an overabundance of fibrin
- d) an inadequacy of thrombokinase

ANSWER: D – AN INADEQUACY OF THOMBOKINASE

Toss-Up

10. MATH; Short Answer: what is the name of the rule used in calculus for evaluating indeterminate limits?

ANSWER: L'HOPITAL'S RULE

Bonus

10. MATH; Multiple Choice: Given the following conditions, if x then y, and if y then not z, which of the following statements is true?

- a) if y then x
- b) if z then x
- c) if x then not z
- d) if y then not x

ANSWER: C – IF X THEN NOT Z

Toss-Up

11. PHYS; Multiple Choice: A body moves with constant speed in a straight line. Which of the following statements must be true?
- a) no force acts on the body
 - b) a single constant force acts on the body in the direction of motion
 - c) a single constant force acts on the body in the direction opposite to the direction of motion
 - d) a net force of zero acts on the body

ANSWER: D – A NET FORCE OF ZERO ACTS ON THE BODY

Bonus

11. PHYS; Short Answer: The explosion of a nuclear weapon releases a large amount of energy in a very brief time interval. Following the explosion, the energy is distributed among delayed radiation, heat radiation, the pressure blast, and prompt radiation. Which of these components accounts for the least amount of energy?

ANSWER: PROMPT RADIATION

Toss-Up

12. CHEM; Multiple Choice: Which organic functional group contains an sp^2 (pron: sp two) hybridized carbon, two oxygen atoms and is not acidic?
- a) ether
 - b) carboxylic acid
 - c) ester
 - d) amine

ANSWER: C - ESTER

Bonus

12. CHEM; Short Answer: What two organic molecules are commonly reacted to produce esters?

ANSWER: AN ALCOHOL AND AN ORGANIC ACID (CARBOXYLIC ACID)

Toss-Up

13. COMP; Multiple Choice: A logic circuit that allows control inputs to select one of several data inputs to pass through to a single output is called:

- a) A decoder
- b) An encoder
- c) A multiplexer
- d) A demultiplexer

ANSWER: C – A MULTIPLEXER

Bonus

13. COMP; Multiple Choice: Which of these kinds of logic gates is complete, in the sense that any combinational logic circuit can be built from this kind of gate alone

- a) AND
- b) OR
- c) XOR (pron: not or)
- d) NAND

ANSWER: D - NAND

Toss-Up

14. BIOL; Short Answer: Name the class of viruses responsible for warts.

ANSWER: PAPILLOMAVIRUSES (PRON: PAP-E-LO-MA-VIRUSES)

Bonus

14. BIOL; Multiple Choice: Which of the following is true of protosomes?

- a) Radial cleavage occurs
- b) The first opening that develops in the gut becomes the anus
- c) The coelom (seal'-um) develops from a split in the mass of the mesoderm
- d) All of the above

ANSWER: C – THE COELUM DEVELOPS FROM A SPLIT IN THE MASS OF THE MESODERM

Toss-Up

15. ASTR; Short Answer: Name the inferior planets.

ANSWER: MERCURY AND VENUS (LOCATED INSIDE THE EARTH'S ORBIT)

Bonus

15. ASTR; Short Answer: Other than the Sun, name the star with the brightest apparent magnitude as viewed from earth.

ANSWER: SIRIUS

Toss-Up

16. PHYS; Multiple Choice: A car experiences both a centripetal and a tangential acceleration. For which of the following would this be true?

- a) it is going around a curve at a constant speed
- b) it is going around a curve and slowing down
- c) it is going along a straight road at a constant speed
- d) it is going along a straight road and increasing in speed

ANSWER: B – IT IS GOING AROUND A CURVE AND SLOWING DOWN

Bonus

16. PHYS; Short Answer: What principle in quantum mechanics states that within a given sub-level, the order of filling with electrons is such that there is the maximum number of half-filled orbitals, and the single electrons in these half-filled orbitals have parallel spins?

ANSWER: HUND'S RULE

Toss-Up

17. CHEM; Multiple Choice: The halogenation reaction of alkanes produces haloalkane products and hydrogen halide, depending upon which halogen molecule is used. The mechanism of the reaction is said to follow a chain reaction free radical model. What would be the molecular shape of the methyl free radical intermediate formed in the reaction on methane and chlorine?

- a) trigonal planar
- b) tetrahedral
- c) linear
- d) pyramidal

ANSWER: A – TRIGONAL PLANAR

Bonus

17. CHEM; Short Answer: The currently accepted model for stratospheric ozone destruction involves a series of free radical reactions which results in destruction of ozone molecules. What is the initiating free radical in the process?

ANSWER: A CHLORINE ATOM (FREE RADICAL)

Toss-Up

18. ERSC; Multiple Choice: Lunar maria are composed chiefly of:

- a) granites
- b) basalts
- c) anorthosite
- d) limestone

ANSWER: B - BASALTS

Bonus

18. ERSC; Multiple Choice: Lunar highlands are composed chiefly of:

- a) granites
- b) sandstones
- c) anorthosite (pron: ah-nor-thah-site)
- d) limestone

ANSWER: C - ANORTHOSITE

Toss-Up

19. GENR; Short Answer: In large commercial buildings, energy consumption is primarily determined by the building's interior – lights, equipment, occupancy, and other contents. Internal loads are managed by the mechanical system of building, called the HVAC (spell out) system. What does HVAC stand for?

ANSWER: HEATING, VENTILATING, AND AIR CONDITIONING (ACCEPT VENTILATION)

Bonus

19. GENR; Multiple Choice: Lighting accounts for one-fourth to one-fifth of total U.S. electricity consumption. Approximately what percentage of that is used by the commercial sector?

- a) 10-20 percent
- b) 40-50 percent
- c) 20-30 percent
- d) 60-70 percent

ANSWER: B – 40-50 PERCENT

Toss-Up

20. PHYS; Short Answer: A workman drops a hammer from a scaffold while working on a bridge. Two seconds later, the hammer hits the ground. How many feet did it fall?

ANSWER: 64 FEET

Bonus

20. PHYS; Short Answer: What was the hammer's velocity in ft/sec upon impact?

ANSWER: 64 FT/SEC

Toss-Up

21. BIOL; Multiple Choice: The mollusks with the most complex nervous systems are:

- a) chitons (KI-tons)
- b) gastropods
- c) cephalopods (SEF-a-lo-pods)
- d) nudibranchs (NEW-di-branks)

ANSWER: C - CEPHALOPODS

Bonus

21. BIOL; Multiple Choice: Which of the following are deuterostomes? (DOO-ter-o-stomes)

- a) annelids and arthropods
- b) chordates and echinoderms (e KIN-o-derms)
- c) flatworms and roundworms
- d) mollusks and echinoderms

ANSWER: B – CHORDATES AND ECHINODERMS

Toss-Up

22. CHEM; Multiple Choice: The shortest carbon-hydrogen bond would be found in:

- a) ethane
- b) ethene
- c) ethyne
- d) benzene

ANSWER: C – ETHYNE (ACETYLENE)

Bonus

22. CHEM; Short Answer: What two atomic orbitals contribute to the carbon hydrogen bond in ethyne?

ANSWER: A 1S ORBITAL FROM HYDROGEN AND AN SP HYBRIDIZED ORBITAL FROM THE CARBON ATOM

Toss-Up

23. PHYS; Multiple Choice: Which of the following statements is not true of a projectile moving near the surface of the earth against negligible air resistance?
- a) the horizontal velocity is constant
 - b) the vertical acceleration is constant
 - c) the horizontal displacement is directly proportional to the time of flight
 - d) the vertical velocity at any given time is independent of the angle of projection

ANSWER: D – THE VERTICAL VELOCITY AT ANY GIVEN TIME IS INDEPENDENT OF THE ANGLE OF PROJECTION

Bonus

23. PHYS; Multiple Choice: An object with 25 kg mass is placed on the moon. Compared to on earth, its mass is:
- a) 6 times greater
 - b) 1/6 as much
 - c) the same
 - d) greater or lower depending upon other conditions

ANSWER: C – THE SAME

Toss-Up

24. MATH; Short Answer: A group could only afford to rent 8 horses or 12 llamas for a camping expedition. If they rented 2 horses, how many llamas could they rent?

ANSWER: 9 LLAMAS

Bonus

24. MATH; Short Answer: what geometric shape is represented in an x-y plot of the equation: $9x^2 + 4y^2 - 18x + 16y = 11$

ANSWER: AN ELLIPSE

Toss-Up

BIOL; Multiple Choice: Which of the following is NOT a characteristic of all chordates at some stage in their lives?

- a) notochord
- b) gill slits
- c) backbone
- d) tail extending beyond anus

ANSWER: C - BACKBONE

Bonus

BIOL; Multiple Choice: In prevertebrate nchordates, the pharyngeal (far-IN-jee-al) slits function frimarily for:

- a) circulation
- b) feeding
- c) gas exchange
- d) both feeding and gas exchange

ANSWER: D – BOTH FEEDING AND GAS EXCHANGE
